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# Technical Memorandum

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Project Title: CDO Response

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## Technical Memorandum [No. 4]

Subject: Silage Process Management Plan

Date: January 13, 2016

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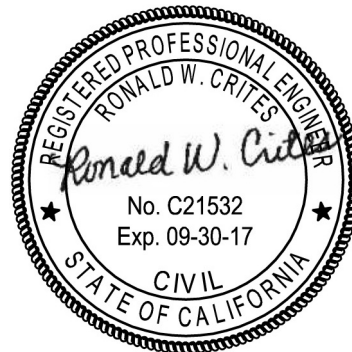
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## Section 1: Background

California silage production is over 11 million tons/year. Morning Star produces approximately 50,000 tons/year of silage. Silage production for animal feed is a well understood process.

The Morning Star Packing Company (Morning Star) operates a silage production operation in conjunction with their tomato processing facility located in Williams, CA. This operation provides an opportunity to reuse wet waste and pomace created from the tomato processing to create silage. The silage is sold to cattle operations for use as feed.

The silage production includes the mixing of tomato wet waste and pomace with other raw materials at ratios that produces a nutritious mix for livestock. Raw materials such as rice hulls, almond hulls and rice straw are trucked into the facility from nearby suppliers. Once mixed, the silage is stored in silage bags on an impervious pad located onsite. Once sold, the silage is transferred to trucks and hauled to the buyer.

## Section 2: Silage Operations

The production of silage occurs during the tomato processing season with maintenance, storage and transfer of finished silage to sellers occurring year round. During the tomato season, the silage operation includes the receipt, temporary storage, mixing, bagging, and maintaining inventory of finished product containing tomato pomace and wet waste material. This operation occurs 24 hours per day, 7 days per week for the duration of the processing season, which generally occurs between July and October.

Year round activities include the opening of the silage bags, and loading of finished product into delivery trucks to be taken to the end customer. Off season operations include repair and maintenance of equipment as necessary, and the loading of trucks for delivery of final product.

## Section 3: Silage Processing Locations

The silage production processes are located in five distinct areas as shown on Figure 1. The areas are described below.

### 3.1 Raw Material Loading Area

The raw material loading area is located on the north side of the plant directly to the east of the finisher deck. Surface material is reinforced concrete slab which has been graded and flows to a gutter to the south for conveyance to the LAA. Morning Star would like to reserve this area for additional mixing. There are two solid waste streams that exit the processing plant. The first is tomato pomace which exits the finisher deck and is carried to the east via auger to waiting removal trailers. The second solid waste stream is green waste. This product consists of tomato vine, whole green and red tomatoes, and other plant matter that has been separated from the unloaded tomatoes upstream. Green waste is moved from rotary screen water separators at ground level to overhead augers that load waiting removal trailers.

## 3.2 Mixing Pad

The mixing pad is an 8" thick, 11,000 sq/ft (Approx. 0.25 Acres) reinforced concrete slab. It is on a 2% grade from west to east and has a "V" gutter that runs the width of the pad from south to north and drains into the adjacent ditch for conveyance to the LAA. Temporary fixtures include approximately 75 cement barriers (Dimensions WxHxL: 2 1/2'x3'x6") which create a barrier between the wet and dry material storage locations and the dirt on both sides of the pad as well as the "V" gutter. A photograph of the mixing pad concrete block barriers is shown in Figure 2. The placement and spacing of these blocks allows drainage of wastewater while retaining solid material.

## 3.3 Wet Material Storage

The raw wet products from the processing plant are stored temporarily on the mixing pad.

## 3.4 Dry Material Storage

Dry material such as rice hulls, rice scalplings, almond hull, almond shell, and rice straw are trucked in from outside suppliers and unloaded in one of two locations. The first and most commonly used location is the silage mixing pad. Individual bunkers are created using cement barriers to create a "U" shape area for the different materials to be unloaded into. The primary location for storage is directly adjacent to the raw materials storage location on the mixing pad. The secondary storage location is overflow in the event that more dry material is brought in than is immediately needed. It is located to the south of the mixing pad in the storm water collection basin. The surface of this basin is hard dirt.

## 3.5 Bagging / Finished Product Storage Pad

The silage bagging and storing the finished bags area is located on approximately 11 acres in the southwest of field MS24. The ground has been lime treated to harden the dirt as a base for chip seal. The whole pad is graded at 1% from the southwest corner draining to the northeast edge into a collection ditch. Currently this creates a barrier between the pad and the adjacent agricultural land and funnels the run-off water to the LAA or the storm water retention pond east of the unloading hill.

# Section 4: Wastewater Management

A small amount of wastewater is produced at the facility by the silage operation. The three sources of wastewater are described below.

## 4.1 Raw Material Loading

The primary source of wastewater in the silage operation is a result of water that is carried through the unloading process in the raw material loading area. Water is trapped and carried via removal trailer to the wet material storage area where, when dumped, runs through the cement barriers and into the adjacent drainage ditch. Whole and partially broken tomatoes in the green waste represent the majority of wastewater discharged from the mixing pad, which flows into the LAA, as it would, if spilled at the factory discharge location.

## 4.2 Finished Product Storage

The second source of water is storm water runoff from the chip sealed finished product storage pad. The storm water is funneled to a collection ditch on the north east edge of the pad which runs to the northwest and into a pipe that drains into the storm water retention basin immediately east of the unloading hill. The chip sealed surface of this pad prevents water from entering the soil beneath the pad and creates a barrier between the two. The amount of water generated from this source is directly proportional to the annual rainfall at the location. This water runoff can also be applied to the adjacent farm fields of 140 acres.

## 4.3 Silage Storage Bags

The third source of water is moisture leaks through the tied-off ends of the silage storage bag. The degree to which moisture content fluctuates is roughly 3% above and below 65% moisture based on 2015's data. Water generated through this leakage is handled the same way as storm water runoff in. The factor that affects this leakage most is the moisture content of the silage mix that is put into the bag (i.e. higher moisture content = greater opportunity to leak, lower moisture content = less likely to leak).

## Section 5: Silage Production Process

The production of silage includes five primary processes. These include: raw material handling, dry material handling, mixing, bagging, and loading the finished product.

### 5.1 Raw Material Handling

Figure 3 and Figure 4 show the flow of wet waste and pomace from the loading area at the processing plant to the mixing pad. The approximate tonnage of material produced by the tomato processing operation during the 2015 season is shown on the table below.

Table 1. Season Total Pomace and Green Waste Weight (Tons)		
Pomace/Seed	Green Waste	Total
22,000	25,500	47,500

### 5.2 Dry Material Handling

Figure 5 describes the receiving process for dry materials. Concrete barrier blocks are used to create a physical barrier in the secondary dry material storage area between where the stored dry material and tomato pomace and wet material.

### 5.3 Mixing Process

Figure 6 describes the mixing process in which pomace, wet waste, and dry materials are added together to create an end product with as close as possible to 65% moisture. During this process a front end loader with a bucket will transfer both wet and dry materials into a dairy feed mixer where the silage is mixed. This is the most critical step in the entire operation; moisture percentages over 70% in the final product puts the silage bags at an increased risk of ripping and resulting product loss. The use of a feed mixer reduces waste associated with mixing using a loader and increases throughput of the entire operation.

## 5.4 Silage Bagging

Figure 7 is a flow chart that shows the steps involved with getting the finished product into silage bags.

## 5.5 Loading Finished Product

Figure 8 provides a process for the receiving, weighing, and delivery of finished feed product. Unloading of silage bags is done with a front loader with bucket attachment. Any spillage is cleaned up using dry shoveling.

## Section 6: Nuisance Condition Prevention

The production of silage involves the use of raw materials that have the potential to create odors or insects. During the 2015 processing season, the facility developed better technology and wastewater/silage handling practices that helped prevent nuisance conditions.

The following measures are taken to prevent odors and insects:

1. Wastewater is drained, collected, and irrigated in a timely fashion. Water is not allowed to remain stagnant.
2. Equipment that comes into contact with raw materials is cleaned daily.
3. Mixing pad and material holding bays are cleaned using a self-propelled brush sweeper at a minimum of every five days.
4. The silage operational area is surveyed daily for pests, especially flies. If a population larger than is normally present is discovered, bait stations are utilized to bring the population back to an acceptable level.
5. Silage bags are inspected and maintained. If a rip in a bag is identified, it is patched using duct tape. The bags of finished product are sealed after being filled.

## Section 7: Silage Operations Contingency Plan

Because the silage operation utilizes a product stream from the tomato processing facility, unexpected extended shut downs of the silage facility can result in the stockpiling of organic material. In order to prevent this from causing nuisance conditions, a contingency plan has been developed. In the event of an unexpected shut down, wet waste and pomace produced from the tomato operations will be hauled off site to be used as cattle feed. Any stockpiled material will be monitored for the development of nuisance conditions and will be removed from the site in a timely manner.

### 7.1 Silage Operation Shut Down Procedures

The silage mixing operation is shut down at the conclusion of the tomato processing season. The mixing pad is cleaned with front end loaders to remove the majority of solid material. The collected material is mixed and bagged like usual. All equipment that comes in contact with silage material is cleaned on the mixing pad to collect the resulting organic matter in one location.

Next, the cement barriers are removed and cleaned, and a sweeper is used to finish cleaning the surface of the mixing pad and remove any traces of organic material. The organic matter that is cleaned from the surface is transported to a local compost operation for disposal.

## 7.2 Potential Groundwater Impact Reduction

Wastewater produced by the tomato processing and silage operations is comingled and applied to the fields at agronomic rates. Crops grown with wastewater will be selected so that they provide adequate water uptake and remove the salts and nitrogen applied to the fields. The wastewater produced by the facility is sampled on a weekly basis during production. Inspections of the fields and wastewater distribution system are performed on a regular basis to ensure that the wastewater is being evenly applied. Monitoring reports are prepared to determine the loading rates to each field.

To prevent leachate from the silage process from impacting groundwater, the silage operations are located on concrete or chip sealed pads. Leachate and runoff is collected and directed into the facility's wastewater distribution system where it is applied to crops. Sanitation and maintenance of the silage operations further reduces the strength of the leachate and runoff and the likelihood of groundwater impacts.




## Figures

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DATE Jan. 2016		PROJECT 148680	SITE	Morning Star CDO Response	Figure 1
			TITLE	Site Map for Silage Operations	





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SITE

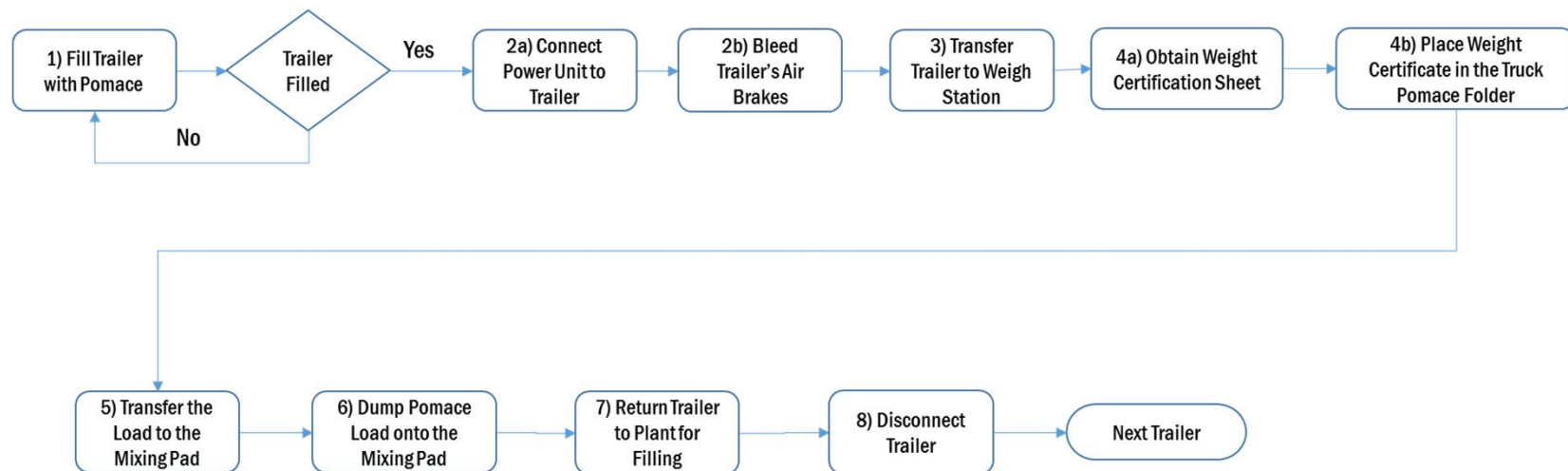
Morning Star CDO Response



TITLE

Concrete Barriers for the Mixing Pad

Figure  
2



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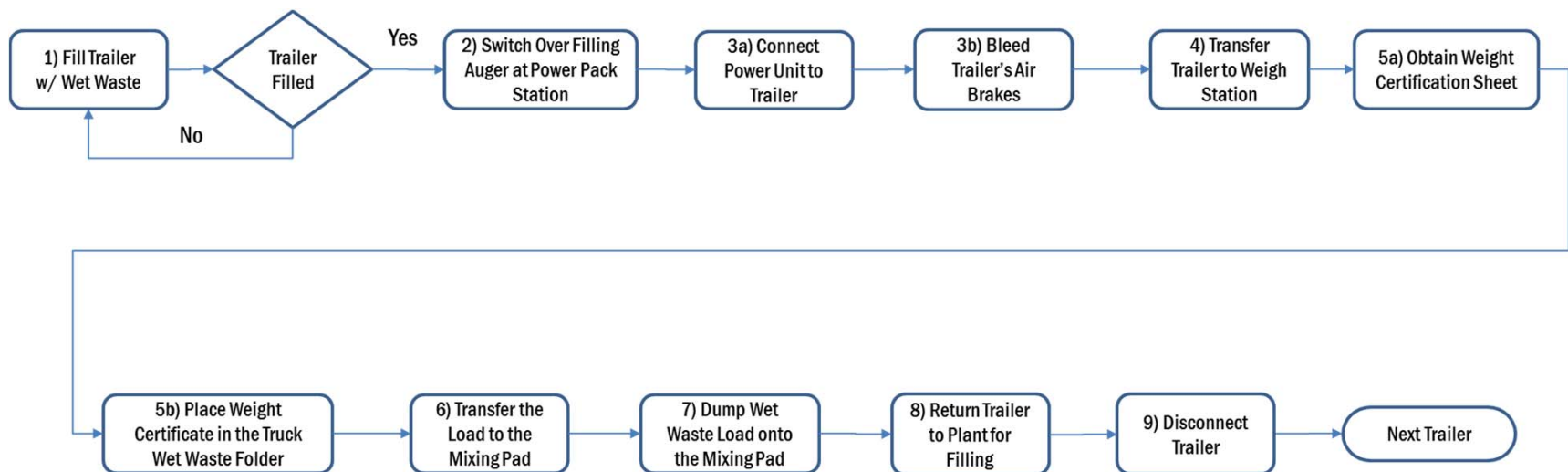
Morning Star CDO Response



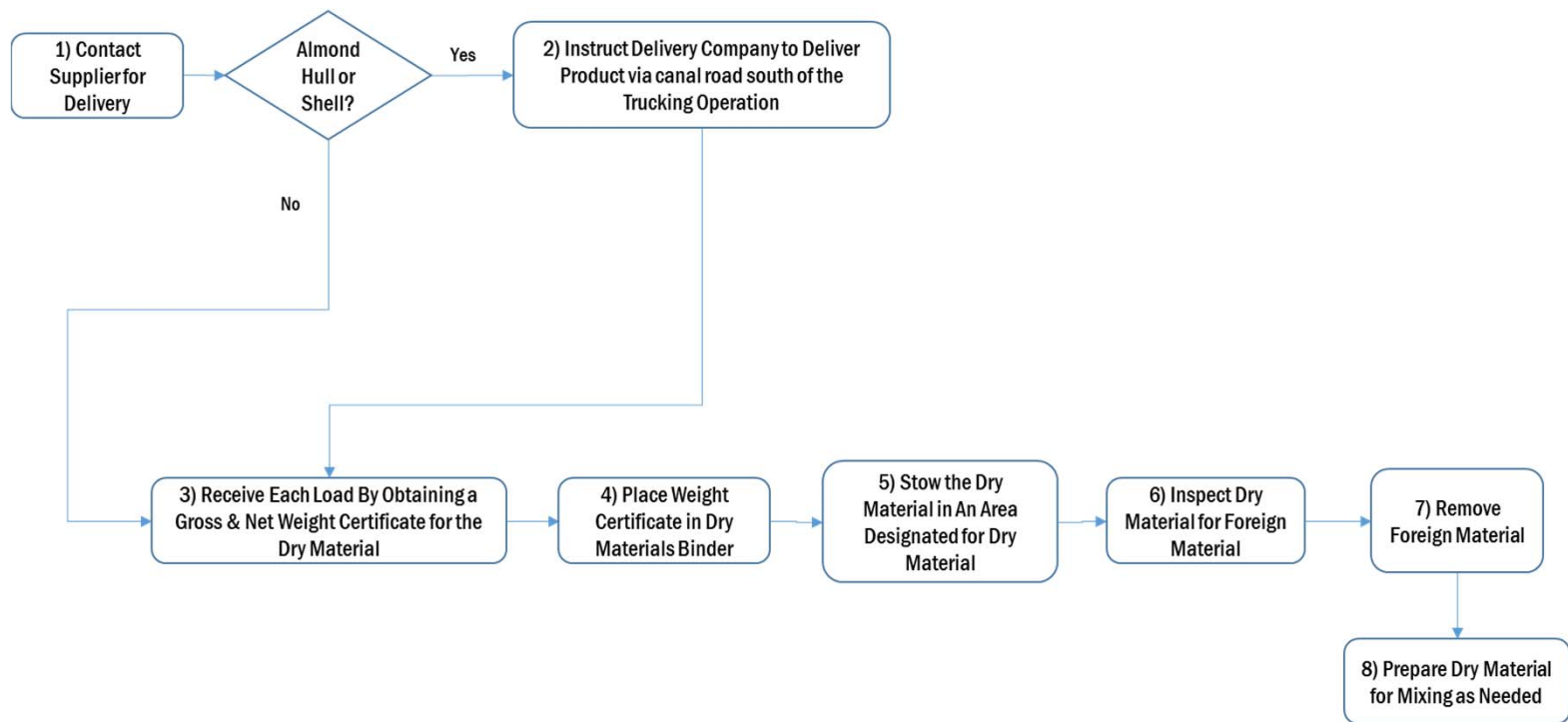
TITLE

Pomace/Seed Pick Up

Figure  
3



DATE Jan. 2016	PROJECT 148680	SITE	Morning Star CDO Response  Green Waste Pick Up	Figure 4
Brown AND Caldwell		TITLE		



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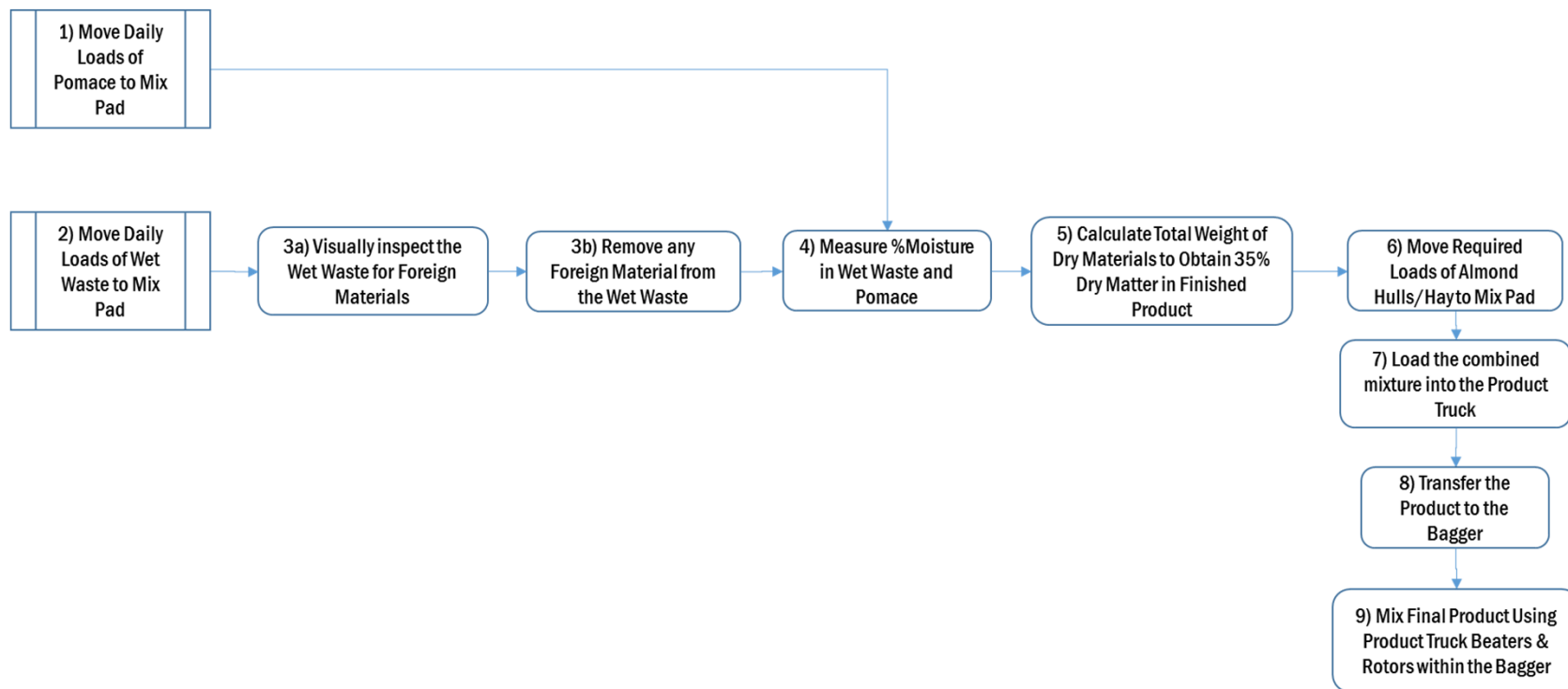
## Morning Star CDO Response



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Receipt of Dry Matter Material (almond hulls/shells, hay, straw...)

Figure  
5



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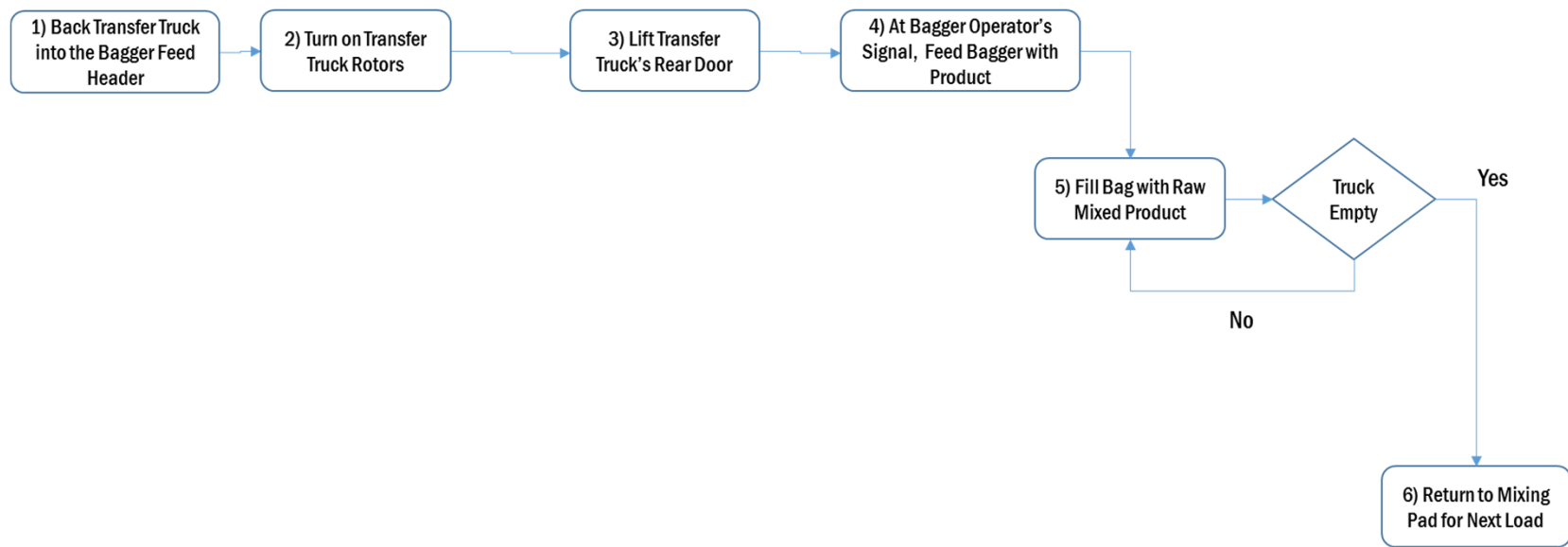
Morning Star CDO Response



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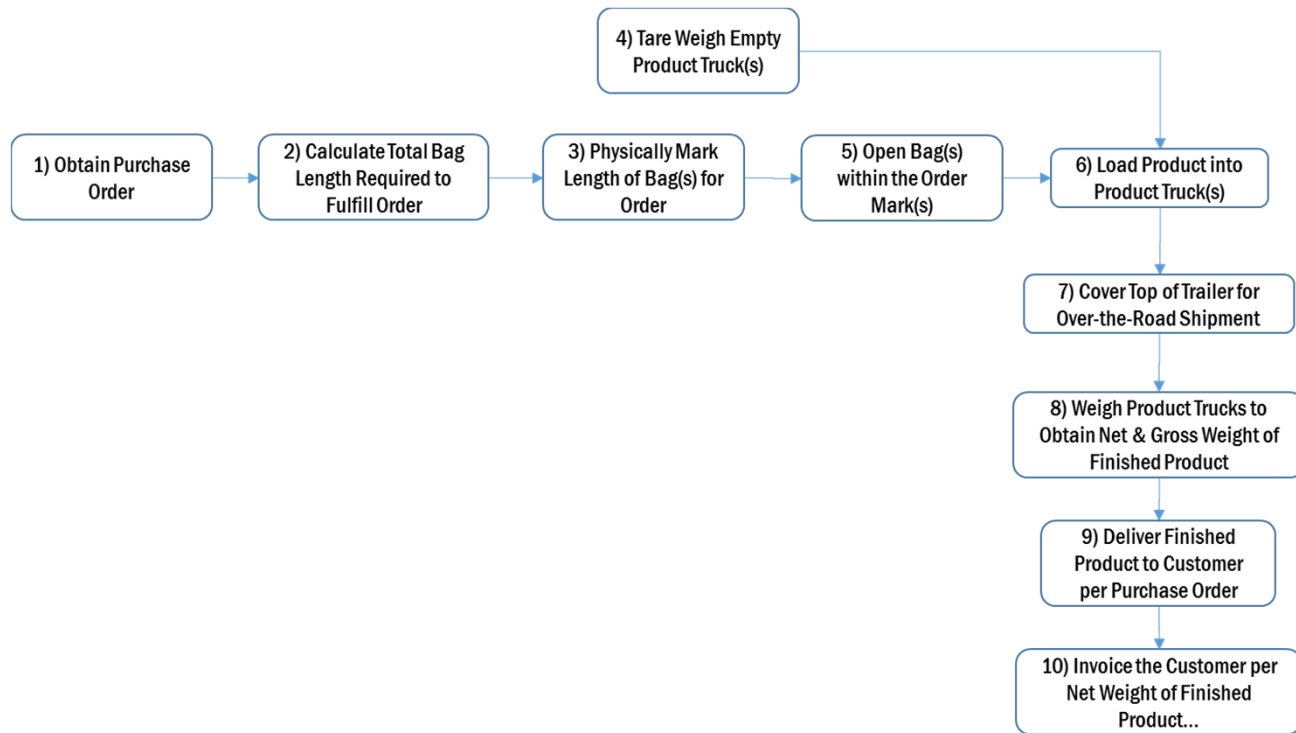
Finished Product Mixing Process

Figure  
6



DATE Jan. 2016	PROJECT 148680	SITE	Morning Star CDO Response  Bagging Finished Product Process	Figure 7
Brown AND Caldwell		TITLE		





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## Morning Star CDO Response



TITLE

## Loading & Delivering Finished Product for Bulk Sale

Figure  
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